

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:

Attorney Docket No.: 2950.27US01

Buckley et al.

Confirmation No.: 5623

Application No.: 09/435,748

Examiner: M. Ruthkosky

Filed: November 8, 1999

Group Art Unit: 1745

For: BATTERIES WITH THIN ELECTRODES

CORRECTED BRIEF FOR APPELLANTS

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is an appeal from an Office Action dated October 23, 2003, in which claims 29-44, 52-54 and 58-89 were finally rejected. The rejection of claims 29-44, 52-54 and 58-89 are appealed herein. A Notice of Appeal was filed on January 23, 2004.

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Peter S. Dardi

Peter S. Dardi

REAL PARTY IN INTEREST

NanoGram Corporation, a corporation organized under the laws of the state of Delaware, and having offices at 2911 Zanker Road, San Jose, California, has acquired the entire right, title and interest in and to the invention, the application, and any and all patents to be obtained therefor, as per the Assignment, recorded at Reel 012089, Frame 0565 from the inventors to NeoPhotonics Corporation and an assignment from NeoPhotonics Corporation to NanoGram Corporation, recorded at Reel 013957, Frame 0076. Note that NeoPhotonics Corporation was formerly called NanoGram Corporation, and the present NanoGram Corporation was previously a wholly owned subsidiary of NeoPhotonics Corporation following the formal name change. The present NanoGram Corporation is now an independent corporation, but affiliated with the earlier NanoGram Corporation, now named NeoPhotonics Corporation.

RELATED APPEALS AND INTERFERENCES

The present party in interest has several unrelated appeals in progress. However, these appeals relate to very different subject matter and relate to different art references.

STATUS OF THE CLAIMS

Claims 29-44, 52-54 and 58-89, which are all of the pending claims, stand rejected. The rejection of these claims is appealed. The pending claims are listed in Appendix A. Claims 1-28, 45-51 and 55-57 are canceled.

STATUS OF AMENDMENTS

The Amendment After Final of December 15, 2003 was not entered, although the Examiner did not explicitly check a box on the Advisory Action of January 26, 2004 whether or not the Amendment would be entered upon the filing of an Appeal. This Amendment was directed to

updating references to pending applications in the specification and to amending dependent claims 30-32 for consistency with previously amended independent claim 29. The claims in the Appendix assume that the Amendment of December 15, 2003 was not entered.

SUMMARY OF INVENTION

This application is directed to dramatic innovations in battery technology made possible by a convergence of advanced technologies. In particular, the application claims battery structures that incorporate electroactive particulate materials within an electrode while forming the electrode with a very thin profile. See, for example, Applicants' specification at page 5, line 26 to page 6, line 5. The ability to form very thin battery electrode opens the possibilities of a range of new battery applications. See, for example, Applicants' specification at page 55, line 12 to page 58, line 29.

One of the cornerstones of this advance is based on the ability to make extremely uniform, ultrafine powders of electroactive material. As described in the specification in detail, these particles can be formed by laser pyrolysis. See, for example, Applicants' specification at page 9, line 24 to page 31, line 35. Electroactive particles formed by laser pyrolysis have demonstrated the ability to have excellent performance that has as good, or in notable circumstances, superior performance with respect to rate and capacity. See, for example, U.S. Patents 6,503,646, 6,391,494, 6,225,007, 6,130,007 and 5,952,125 and published application 2002/0192137A1. These high quality particles allow for the formation of smooth thin electrodes with desirable performance capabilities. See, for example, Applicants' specification at page 49, line 11 to page 52, line 31. In particular, these particles are highly dispersable so that they are excellent for forming coatings and thin layers generally. See, for example, page 52, line 32 to page 55, line 11. Without the ability to form good dispersions, the formation of thin smooth

films would be difficult or impossible. The dispersion abilities of particles formed by laser pyrolysis is described further in U.S. Patent 6,599,631 and PCT application WO 0 132 799A1.

Even with the improved materials described above, conventional processing approaches for battery electrodes is not suited for the formation of arbitrarily thin films. In particular, using a thick paste that is subjected to pressure is designed for forming films of moderate thickness. Applicants' present specification describes improved approaches specifically designed for the formation of thin electrodes. See the section of the application entitled "Production of Thin Electrodes And Batteries," at page 52, line 32 to page 55, line 11. In particular, the formation of dispersions and coating processes are presented. The Example in the specification describes the formation of appropriately smooth electrodes. It is the combination of new processing approaches and improved nanoscale materials that open the door to the new structures claimed in the present application.

ISSUES

1. Whether claims 29-44, 52-54 and 58-77 are indefinite under 35 U.S.C. § 112, second paragraph?
2. Whether the pending claims have introduced new matter into the application?
3. Whether claims 29-33, 39, 58-63, 69, 76, 84, 85 and 88 are anticipated under 35 U.S.C. § 102(e) by U.S. Patent 6,033,805 to Dansui et al.?
4. Whether claims 78-83 and 86-89 are obvious under 35 U.S.C. § 103(a) over the '805 patent to Dansui et al.?
5. Whether claims 34, 35, 37, 38, 41, 52, 54, 64, 65, 67, 68, 71-75 and 77 are obvious under 35 U.S.C. § 103(a) over the '805 patent to Dansui et al. in view of U.S. Patent 5,571,638 to Satoh et al.?

6. Whether claims 34-43, 53, 64-68, 70-73, 76 and 77 are obvious under 35 U.S.C. § 103(a) over the '805 patent to Dansui et al. in view of U.S. Patent 6,165,642 to Kawakami et al.?
7. Whether claims 36 and 66 are obvious under 35 U.S.C. § 103(a) over the '805 patent to Dansui et al. in view of the '642 patent to Kawakami et al. and further in view of U.S. Patent 6,037,095 to Miyasaka et al.?

GROUPING OF CLAIMS

1. Claims 29-39, 41-44, 53, 58-74, 76 form a first claim group directed to a battery with an electrode with an average thickness less than about 9.5 microns in which the electrode comprises electroactive particles.
2. Claim 40 forms a second claim group directed to a battery having a separator comprising a non-liquid electrolyte.
3. Claims 52 and 75 form a third claim group directed to a battery with an electrode having a root mean square surface roughness less than about 5 microns.
4. Claims 54 and 77 form a fourth claim group directed to a battery with an electrode having a thickness less than 10 microns and electroactive particles with a specified size uniformity.
5. Claims 78-83 form a fifth claim group directed to a battery with an electrode having an average thickness of no more than about 5 microns.
6. Claims 84 and 85 form a sixth claim group directed to a battery comprising an electrode with a current collector having an average thickness of less than about 4.5 microns and the electrode having an average thickness less than about 10 microns.

7. Claims 86 and 87 form a seventh claim group directed to a battery comprising an electrode with a current collector having an average thickness less than 4.5 microns and the electrode having an average thickness less than 5 microns.

8. Claims 88 and 89 form an eighth claim group directed to a battery comprising an electrode with a current collector having a thickness less than 2.5 microns and the electrode having an average thickness less than 10 microns.

ARGUMENT

I. LEGAL BACKGROUND

The Court of Appeals for the Federal Circuit has exclusive appellate jurisdiction for cases arising under the patent law under 28 U.S.C. § 1295 (a)(1). Federal Circuit patent law is subject to review by the U.S. Supreme Court. The Federal Circuit has adopted as binding precedent all holding of its predecessor courts, the U.S. Court of Claims and the U.S. Court of Customs and Patent Appeals. South Corp. v. U.S., 215 USPQ 657 (Fed. Cir. 1982). Therefore, unless they have been overruled en banc or by the Supreme Court, CCPA cases are binding precedent for the present appeal.

A. INDEFINITENESS

The patent statute at 35 U.S.C. § 112, second paragraph, requires that the "specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention." "Whether a claim is invalid for indefiniteness requires a determination whether those skilled in the art would understand what is

claimed when the claim is read in light of the specification." Morton International Inc. v. Cardinal Chemical Co., 28 USPQ2d 1190, 1194 (Fed. Cir. 1993).

"The district court, though discussing enablement, spoke also of indefiniteness of 'stretch rate,' a matter having to do with § 112, second paragraph, and relevant in assessment of infringement. The use of stretching * * * at a rate exceeding **about** 10% per second' in the claims is not indefinite. Infringement is clearly assessable through use of a stop watch." W. L. Gore & Associates, Inc. v. Garlock, Inc., 220 USPQ 303, 316 (Fed. Cir. 1983)(emphasis added). In contrast, when "the meaning of claims is in doubt, especially when ... there is close prior art, they are properly declared invalid." Amgen Inc. v. Chugai Pharmaceutical Co. Ltd., 18 USPQ2d 1016, 1031 (Fed. Cir. 1991). "In arriving at this conclusion, we caution that our holding that the term "about" renders indefinite claims 4 and 6 should not be understood as ruling out any and all uses of this term in patent claims." Id. "The meaning of the word 'about' is dependent on the facts of a case, the nature of the invention, and the knowledge imparted by the totality of the earlier disclosure to those skilled in the art." Eiselstein v. Frank, 34 USPQ2d 1467, 1471 (Fed. Cir. 1995). This last case outlines how the term "about" is generally interpreted in patent claims.

The fact that scientific measurements have a certain precision associated with them has led one court to conclude that a whole number inherently has an approximate nature. See Eiselstein v. Frank, above ("Such a description indicates that Eiselstein knew how to be precise when he intended to, and supports the conclusion that otherwise, when a whole number was stated, a precise amount was not intended.").

B. WRITTEN DESCRIPTION REQUIREMENT

Under 35 U.S.C. § 112, first paragraph, the "specification shall contain a written description of the invention,...." It has long been held that the written description requirement is separate from other patentability requirements. In re DiLeone, 168 USPQ 592, 593 (CCPA

1971)("[I]t is possible for a specification to enable the practice of an invention as broadly as claimed, and still not describe that invention."). It has also long been held that the specification does not need to use the exact language of the claim for the written description requirement to be satisfied. In re Smith, 178 USPQ 620, 624 (CCPA 1973)("This court has held that claimed subject matter need not be described in haec verba in the specification in order for that specification to satisfy the description requirement, although where there is exact correspondence between the claim language and original disclosure, the description requirement would normally be satisfied."). "A fairly uniform standard for determining compliance with the 'written description' requirement has been maintained throughout [the period from the Federal Circuit's inception]: 'Although [the applicant] does not have to describe exactly the subject matter claimed, . . . the description must clearly allow persons of ordinary skill in the art to recognize that [he or she] invented what is claimed.'" Vas-Cath, Inc. v. Muhurkar, 19 USPQ2d 1111, 1116 (Fed. Cir. 1991)(quoting from In re Gosteli, 10, USPQ2d 1614, 1618 (Fed. Cir. 1989)).

Within this well settled framework, written description requirements relating to a range limitation in a claim have also been settled for many years. In 1976, for example, the Court of Customs and Patent Appeals held that a disclosure of a range of 25% to 60% solids content, which was supported by two examples that fell within that range, was sufficient support for a claim to a range of 35% to 60%. In re Wertheim, 191 USPQ 90, 98 (C.C.P.A., 1976). The court further held that: "Inventions are constantly made which turn out to be patentable, and applicants frequently discover during the course of prosecution that only a part of what they invented and originally claimed is patentable. . . . **To rule otherwise would let form triumph over substance, substantially eliminating the right of an applicant to retreat to an otherwise patentable species merely because he erroneously thought he was first with the genus when he filed.**" Id. at 97 (emphasis added). "The burden of showing that the claimed invention is not

described in the specification rests on the PTO in the first instance, and it is up to the PTO to give reasons why a description not in *ipsis verbis* is insufficient." Id.

The Court of Customs and Patent Appeals also articulated this principle in In re Eickmeyer (202 USPQ 655 (C.C.P.A. 1979)) when it stated that an applicant "need not claim all he is entitled to claim and need have support only for what he does claim. **We are not persuaded that there is any requirement for [an applicant] to demonstrate the criticality of a lower limit to meet a description requirement.**" Id. at 663 (emphasis added). On the facts of this case, replicate tests at 56°C and 80°C along with knowledge in the art that comparable process could be operated above 80°C were found to support a claim to the process at an elevated temperature of at least about 56°C. Id.

Similarly, in an interference context, a disclosure in a grandparent application of a nickel concentration from 45% to 55% was found to provide written description for "about 45% to about 55%" but not for the range of 50% to 60% that extended significantly beyond the limit in the grandparent application. Eiselstein v. Frank, 34 USPQ2d 1467, 1471 (Fed. Cir. 1995). Similarly, the disclosure in a specification of 4-12 turns per inch with 8 being preferred was found to support a range of 8-12 turns per inch in the issued claim for a yarn. Kolmes v. World Fibers Corp., 41 USPQ2d 1829, 1832 (Fed. Cir. 1997). As described in a recent Federal Circuit case, the explicit description should be gleaned for what it describes to a person of ordinary skill in the art. Enzo Biochem Inc. v. Gen-Probe Inc., 63 USPQ2d 1609, 1615 (Fed. Cir. 2002), reversing upon rehearing an earlier decision at 62 USPQ2d 1289 (Fed. Cir. 2002).

C. ANTICIPATION

1. Examiner's Burden

The Examiner has the burden of establishing a prima facie case of anticipation. As such, the Examiner must provide a reference that discloses every element as set forth in the claim. "A

claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” Verdegaal Bros. v. Union Oil Co. of California, 814 F2d. 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987) (MPEP §2131).

2. A Single Reference Must Identically Disclose Every Element Set Forth In a Claim To Anticipate The Claim

“In order to constitute anticipatory prior art, a reference must identically disclose the claimed compound...” MPEP 2122 citing In re Schoenwald, 22 USPQ2d 1671, (Fed. Cir. 1992). "For a prior art reference to anticipate in terms of 35 U.S.C. § 102, **every element of the claimed invention must be identically shown in a single reference**. These elements must be arranged as in the claim under review, but this is not an 'ipsissimis verbis' test." In re Bond, 15 USPQ2d 1566, 1567 (Fed. Cir, 1990)(Internal citations omitted and emphasis added.).

"If the prior art reference does not expressly set forth a particular element of the claim, that reference still may anticipate if that element is 'inherent' in its disclosure. To establish inherency, the intrinsic evidence 'must make it clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" In re Robertson, 49 USPQ2d 1949, 1950, 1951 (Fed. Cir. 1999), citing Continental Can Co. v. Monsanto Co., 20 USPQ2d 1746, 1749 (Fed. Cir. 1991).

"Every element of the claimed invention must be literally present, arranged as in the claim. **The identical invention must be shown in as complete detail as is contained in the patent claim.**" Richardson v. U.S. Suzuki Motor Corp., 9 USPQ2d 1913, 1920 (Fed. Cir. 1989)(Internal citations omitted, and emphasis added.); see also MPEP 2131. "Here, as well, anticipation is **not** shown by a prior art disclosure which is only '**substantially the same**' as the

claimed invention." Jamesbury Corp. v. Litton Industrial Products, Inc., 225 USPQ 253, 256 (Fed. Cir. 1985)(emphasis added).

Similar requirements also hold under an obviousness rejection. Prima facie obviousness is not established if all the elements of the rejected claim are not disclosed or suggested in the cited art. In re Ochiai, 37 USPQ 1127, 1131 (Fed. Cir. 1995). ("The test for obviousness *vel non* is statutory. It requires that one compare the claim's 'subject matter as a whole' with the prior art 'to which said subject matter pertains.'"). See also, MPEP 2143.03 "All Claim Limitations Must Be Taught or Suggested," citing In re Royka, 180 USPQ 580 (CCPA 1974). "To establish prima facie obviousness of a claimed invention, all of the claim limitations must be taught or suggested by the prior art." MPEP 2143.03.

3. To Support A Finding Of Unpatentability Based On Cited Art, The Cited Art Must Provide A Means Of Obtaining The Claimed Composition Or Apparatus

The proposition is well established that the cited art only renders a composition of matter or apparatus unpatentable to the extent that the cited art enables the disputed claims, in other words, if the cited art provides a means of obtaining the claimed composition or apparatus.

To the extent that anyone may draw an inference from the Von Bramer case that the mere printed conception or the mere printed contemplation which constitutes the designation of a 'compound' is sufficient to show that such a compound is old, regardless of whether the compound is involved in a 35 U.S.C. 102 or 35 U.S.C. 103 rejection, we totally disagree. ... We think, rather, that the true test of any prior art relied upon to show or suggest that a chemical compound is old, is whether the prior art is such as to place the disclosed 'compound' in the possession of the public. In re Brown, 141 USPQ 245, 248-49 (CCPA 1964)(emphasis in original)(citations omitted).

Similarly, see In re Hoeksema, 158 USPQ 596, 600 (CCPA 1968)(emphasis in original):

We are certain, however, that the invention as a whole is the claimed compound and a way to produce it, wherefore appellant's argument has substance. There has been no showing by the Patent Office in this record that the claimed compound can exist because there is no

showing of a known or obvious way to manufacture it; hence, it seems to us that the 'invention as a whole,' which section 103 demands that we consider, is not obvious from the prior art of record.

While there are valid reasons based on public policy as to why this defect in the prior art precludes a finding of obviousness under section 103, *In re Brown*, supra, its immediate significance in the present inquiry is that it poses yet another difference between the claimed invention and the prior art which must be considered in the context of section 103. So considered, we think the differences between appellant's invention as a whole and the prior art are such that the claimed invention would not be obvious within the contemplation of 35 U.S.C. 103.

The Federal Circuit has further emphasized these issues. Assertions in a prior art reference do not support an anticipation or obviousness rejection unless the references place the claimed invention in the hands of the public. Beckman Instruments Inc. v. LKB Produkter AB, 13 USPQ2d 1301, 1304 (Fed. Cir. 1989). "In order to render a claimed apparatus or method obvious, the prior art must enable one skilled in the art to make and use the apparatus or method." *Id.* While a properly citable reference is prior art for all that it teaches, references along with the knowledge of a person of ordinary skill in the art must be enabling to place the invention in the hands of the public. *In re Paulsen*, 31 USPQ2d 1671, 1675 (Fed. Cir. 1994). See also *In re Donohue*, 226 USPQ 619, 621 (Fed. Cir. 1985). "[A] § 102(b) reference "must sufficiently describe the claimed invention to have placed the public in possession of it." Paperless Accounting, Inc. v. Bay Area Rapid Transit Sys., 804 F.2d 659, 665 (Fed. Cir. 1986), cert. denied, 480 U.S. 933 (1987)(quoting *In re Donohue*, 766 F.2d at 533). An enabling disclosure is one that allows a person of ordinary skill to practice the technology without undue experimentation based on the guidance in the disclosure along with what is well known in the art. *In re Wands*, 858 F. 2d 731, 737 (Fed. Cir. 1988).

C. OBVIOUSNESS

1. The Examiner bears the burden of demonstrating nonobviousness.

The Applicants note that the patent office has the burden of persuasion in showing that the Applicants are not entitled to a patent. "[T]he conclusion of obviousness vel non is based on the

preponderance of evidence and argument in the record." In re Oetiker, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). The patent office has the ultimate burden of persuasion in establishing that an applicant is not entitled to a patent. Id. at 1447, concurring opinion of Judge Plager. **"The only determinative issue is whether the record as a whole supports the legal conclusion that the invention would have been obvious."** Id.

"In rejecting claims under 35 U.S.C. §103, the examiner bears the initial burden of presenting a prima facie case of obviousness." In re Rijckaert, 28 USPQ2d 1955, 1956 (Fed. Cir. 1993). Prima facie obviousness is not established if **all the elements** of the rejected claim are not disclosed or suggested in the cited art. In re Ochiai, 37 USPQ 1127, 1131 (Fed. Cir. 1995). ("The test for obviousness *vel non* is statutory. It requires that one compare the claim's 'subject matter as a whole' with the prior art 'to which said subject matter pertains.'"). See also, MPEP 2143.03 "All Claim Limitations Must Be Taught or Suggested," citing In re Royka, 180 USPQ 580 (CCPA 1974). "It is impermissible, however, to simply engage in a hindsight reconstruction of the claimed invention, using applicant's structure as a template and selecting elements from references to fill the gaps." In re Gorman, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991).

If the Examiner fails to establish a prima facie case of obviousness, the obviousness rejection must be withdrawn as a matter of law. In re Ochiai, 37 USPQ at 1131 ("When the references cited by the examiner fail to establish a prima facie case of obviousness, the rejection is improper and will be overturned.").

2. There Must Be Motivation In The Art To Modify The Teachings Of the Cited References

The motivation, or suggestion, to combine references must be either explicitly or implicitly in the references or knowledge "generally available to one of ordinary skill in the art." See, MPEP § 2143.01. Furthermore, "[t]he test for an implicit showing is what the combined

teachings, knowledge of one of ordinary skill in the art, and nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art.” See, MPEP §2143.01 (quoting In re Kotzab, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000)).

The Federal Circuit has provided considerable guidance on establishing obviousness of a claim based on a combination of references. "Our case law makes clear that the best defense against hindsight-based obviousness analysis is the rigorous application of the requirement of a teaching or motivation to combine the prior art references." *Ecolchem Inc. v. Southern Edison*, 56 USPQ2d 1065, 1073 (Fed. Cir. 2000). "Therefore, '[w]hen determining the patentability of a claimed invention which combines two known elements, 'the question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination.' " *Id.* (quoting *In re Beattie*, 24 USPQ2d 1040, 1042 (Fed. Cir. 1992)(quoting *Lindemann Maschinenfabrik GmbH v. American Hoist and Derrick Co.*, 221 USPQ 481, 488 (Fed. Cir. 1984))). "In order to prevent a hindsight-based obviousness analysis, we have clearly established that the relevant inquiry for determining the scope and content of the prior art is whether there is a reason, suggestion, or motivation in the prior art or elsewhere that would have led one of ordinary skill in the art to combine the references." *Ruiz v. A.B. Chance Co.*, 57 USPQ2d 1161, 1167 (Fed. Cir. 2000). "The test is not whether one device can be an appropriate substitute for another." *Id.* In *Ruiz*, the Federal Circuit overturned a district court holding that "it would have been obvious to combine screw anchors and metal brackets, because the need for a bracket 'was apparent.'" *Id.*

When the modification of an apparatus renders the apparatus "**inoperative for its intended purpose**," the reference teaches away from the suggested modification. In re Gordon, 221 USPQ 1125, 1127 (Fed. Cir. 1984)(emphasis added). "If when combined, the references 'would produce a seemingly inoperative device,' then they teach away from their combination." Tec Air Inc. v. Denso

Manufacturing Michigan Inc., 52 USPQ2d 1294, 1298 (Fed. Cir. 1999)(citing In re Sponnoble, 160 USPQ 237, 244 (CCPA 1969)).

3. The References Must Provide A Reasonable Expectation Of Success

While a reference is prior art for all that it teaches, references along with the knowledge of a person of ordinary skill in the art must be enabling to place the invention in the hands of the public. In re Paulsen, 31 USPQ2d 1671, 1675 (Fed. Cir. 1994). See also In re Donohue, 226 USPQ 619, 621 (Fed. Cir. 1985). "The consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art that this process should be carried out and would have a reasonable likelihood success, viewed in light of the prior art." Micro Chemical Inc. v. Great Plains Chemical Co., 41 USPQ2d 1238, 1245 (Fed. Cir. 1997)(quoting In Re Dow Chemical Co., 5 USPQ2d 1529, 1531 (Fed. Cir. 1988)).

4. The References Must Teach Or Suggest All Of The Claim Elements

"To establish prima facie obviousness of a claimed invention, all of the claim limitations must be taught or suggested by the prior art." MPEP 2143.03.

5. Obviousness Over A Single Prior Art Reference

The importance of the principle that the prior art itself must suggest the motivation to modify the teachings of a reference was eloquently stated in In re Rouffet, 47 USPQ2d 1453, 1458 (Fed. Cir. 1998)(emphasis added):

The Board did not, however, explain what specific understanding or technical principle within the knowledge of one of ordinary skill in the art would have suggested the combination. **Instead the board merely invoked the high level of skill in the field of the art. If such a rote invocation could suffice to supply a motivation to combine, the more sophisticated scientific fields would rarely, if ever, experience a patentable technical advance.** Instead, in complex scientific fields, the Board could routinely identify the prior art elements in an application,

invoke the lofty level of skill, and rest its case for rejection. **To counter this potential weakness in the obviousness construct, the suggestion to combine requirement stands as a critical safeguard against hindsight analysis and rote application of the legal test for obviousness.**

Similar principles must be applied when obviousness is based on the teachings of a single cited reference.

In appropriate circumstances, a single prior art reference can render a claim obvious. However, there must be a showing of a suggestion or motivation to modify the teachings of that reference to the claimed invention in order to support the obviousness conclusion. This suggestion or motivation may be derived from the prior art reference itself, from the knowledge of one of ordinary skill in the art, or from the nature of the problem to be solved. **Determining whether there is a suggestion or motivation to modify a prior art reference is one aspect of determining the scope and content of the prior art, a fact question subsidiary to the ultimate conclusion of obviousness.**

Sibia Neurosciences, Inc. v. Cadus Pharmaceutical Corp., 55 USPQ2d 1927, 1931 (Fed. Circuit 2000)(internal citations omitted, emphasis added).

II. ANALYSIS

A. INDEFINITENESS REJECTION

The Examiner rejected claims 29-44, 52-54 and 58-77 under 35 U.S.C. § 112, second paragraph as being indefinite. In particular, the Examiner maintains that the use of the term “about” in the claim renders the claims of indefinite scope. Furthermore, with respect to claims 36, 38, 66 and 68, the Examiner maintains that the use of the term “derivative” renders the claims indefinite. Applicants maintain that the claims are not prima facie indefinite since a person of ordinary skill in the art can assess whether or not a particular structure is covered under the claims. Applicants respectfully request reconsideration of the rejections based on the following analysis.

It is well established in the case law that the term "about" is interpreted in a claim based on the particular facts of the case. Similarly, the case law has acknowledged the clear fact that continuous variables have a precision associated with them that inherently introduces a range of meaning to a particular number. Thus, a whole number may have meaning with respect to counting numbers of something, but it does not have precise meaning with respect to a continuous variable. Thus, if an object is stated to be 10 inches long, this clearly really means that it is 10 inches +/- some precision related to the measurement in the particular art field. See, e.g., Eiselstein v. Frank, supra. ("Such a description indicates that Eiselstein knew how to be precise when he intended to, and supports the conclusion that otherwise, when a whole number was stated, a precise amount was not intended.").

While the Examiner asserts that the term "about" in the claims renders them indefinite, the Examiner at the same time uses this term to assert a very broad scope with respect to the term "about" in formulating the anticipation rejection described below. However, a person of ordinary skill in the art would not take either of these extreme views, as discussed further with respect to the anticipation rejection. In summary, the use of the term "about" reflects the natural imprecision in expressing continuous variables with approximate cut off values at a particular precision. Thus, Applicants' claims are clear to a person of ordinary skill in the art.

With respect to the term "derivative," Applicants respectfully assert that the Examiner has improperly stated the facts. In response to Applicants' previous arguments, the Examiner indicated on page 13 of the Final Office Action that "The specification offers no guidance as to derivatives that may be considered within or beyond the bounds of the claim." But that is indeed the point. **All derivatives** are within the boundaries of the claim. All a person of ordinary skill in the art must be able to do is evaluate whether or not a composition is a derivative. The Examiner has not asserted that this cannot be done. The Examiner seems to be trying to redraft the claim to cover only some unspecified derivatives. But this is not Applicants' intent. As

drafted, a person of ordinary skill in the art can reasonably evaluate the claim scope. No more is demanded by the statute. Therefore, the use of the term “derivative” does not render the claim indefinite.

In view of the above comments, Applicants respectfully request withdrawal of the rejection of claims 29-44, 52-54 and 58-77 under 35 U.S.C. § 112, second paragraph as being indefinite.

B. WRITTEN DESCRIPTION REJECTION

The Examiner phrased this issue as an objection to the specification. However, this framing of the issue is clearly contrary to PTO practice and case law, as explained below. Thus, this issue is reframed for analysis as a rejection for lack of Written Description.

The Examiner objected to the specification under 35 U.S.C. § 132 as introducing new matter. The written description requirement under 35 U.S.C. § 112, first paragraph can be in many instances directly related to the prohibition against introduction of new matter. See, for example, In re Bowen, 181 USPQ 48 (CCPA 1974). As instructed by the MPEP **2163.06**, an Examiner should reject claims under the written description requirement if the asserted new matter is presented in the **claims**. These instructions are well supported by the case law. As such, Applicants will analyze this rejection under the written description framework for appropriate analytical structure. Applicants maintain that the case law, summarized above, fully supports the presence of written description in the specification for the present claims.

With all due respect, the Examiner's sole assertion that there is no explicit disclosure of the claimed ranges does not present a case of prima facie lack of written description. According

to MPEP 2163.04(I), an examiner must "establish a prima facie case by providing reasons why a person of ordinary skill in the art at the time the application was filed would not have recognized that the inventor was in possession of the invention as claimed in view of the disclosure of the application as filed."

The Examiner would seem to assert that the specification supports a range of **average** electrode or separator thickness of less than 10 microns. This would **without a doubt** include an **average** thickness of 9.5 microns or any other **average** thickness less than 10 microns. Based on this there can be no doubt that a person of ordinary skill in the art would recognize that the application as filed included possession of an average thickness of 9.5 microns. If it is without a doubt that there was possession of an **average** thickness of 9.5 and suitable values less than this value, how can it be asserted for the purpose of written description there was no possession of an average thickness of less than 9.5 microns, as presently claimed? This conclusion requires resorting to some analytical straightjacket over reason, and is clear legal error. Possession is obvious, and written description is well established.

The claims are fully supported by the specification as substantiated by well established case law. Applicants respectfully request withdrawal of the rejection of the objection to the specification.

C. ANTICIPATION REJECTION

The Examiner rejected claims 29-33, 39, 58-63, 69, 76, 84, 85 and 88 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent 6,033,805 to Dansui et al. (the Dansui patent, Appendix B). The Examiner based this rejection on an assertion that 10 microns is interpreted to be less than about 9.5 microns. Applicants respectfully assert that the Examiner has not used proper claim construction. Under a reasonable claim construction, Applicants maintain that the

Dansui patent does not render Applicants' claimed invention prima facie anticipated. Applicants respectfully request reconsideration of the rejection based on the following comments.

While an examiner has a mandate to give claims their broadest **reasonable** interpretation, **the interpretation must be reasonable when viewed by a person of ordinary skill in the art.** See, for example, MPEP 2111, second paragraph. With respect to electrode thickness, Applicants assert that a person of ordinary skill in the art would not interpret less than about 9.5 microns to cover 10 microns. In particular, the precision asserted by the numbers indicate values on the order of 0.1 microns as the uncertainty in the specified numbers. Measurements on a micron scale would not entail an imprecision required to support the present rejection.

Since the Examiner's claim interpretations are not reasonable from the perspective of a person of ordinary skill in the art, the Dansui patent clearly does not prima facie anticipate Applicants' claimed invention.

Group 6 Claims

These claims have a current collector with a thickness less than about 4.5 microns. Similar to the discussion above with respect to electrode thickness, it is not reasonable to assert that a current collector with an average thickness of less than about 4.5 microns would cover a current collector with a thickness of 5 microns. The specification of the Dansui patent described preferred ranges of nickel foil thickness of **preferably** 5-20 microns. The examples only describe foil thickness of 10 microns or greater. The Dansui patent clearly does not teach current collectors of less than about 4.5 microns.

Group 8 Claim

The basis for the Examiner's anticipation rejection of claim 88 is not clear from the final Office Action. Perhaps, since this claim was also rejectioned for obviousness, it was a typographical error to include claim 88 in the anticipation rejection since the features of the

claim do not match the corresponding description. In any case, the Dansui patent clearly does not prima facie anticipate this claim.

Summary of Anticipation Issues

The Dansui patent clearly does not prima facie anticipate Applicants' claimed invention. Applicants respectfully request withdrawal of the rejection of claims 29-33, 39, 58-63, 69, 76, 84, 85 and 88 under 35 U.S.C. § 102(e) as being anticipated by the Dansui patent.

D. OBVIOUSNESS OVER DANSUI ET AL.

The Examiner rejected claims 78-83 and 86-89 under 35 U.S.C. § 103(a) as being obvious over the Dansui patent alone. The Examiner admits that the Dansui patent does not teach an electrode with a thickness of less than about 5 microns or a current collector less than about 2.5 microns. However, the Examiner asserts that a person of ordinary skill in the art would modify the teachings of the Dansui patent to form Applicants' claimed invention. With all due respect, there are several shortcomings to the Examiner's arguments, not the least of which is that the Dansui patent itself teaches away from the modifications. The Dansui patent does not teach, suggest or motivate Applicants' claimed invention and does not render Applicants' claimed invention prima facie obvious. Applicants respectfully request reconsideration of the rejection based on the following comments.

First, the Dansui patent teaches that the “**preferred**” electrode thickness is 10-60 microns for the cathode (column 3, lines 9-10) and 19-50 microns for the anode (column 3, lines 14-15). Thus, the Dansui patent **teaches away** from an electrode with a thickness of less than about 5 microns. Similarly, the Dansui patent teaches a current collector with a “**preferred**” thickness of 5-20 microns (column 3, lines 3-4). Thus, the Dansui patent teaches away from a current collector with a thickness less than about 2.5 microns.

Further to the point, the Dansui patent provides no hint of a motivation to form Applicants' claimed invention. The stated motivation in the Dansui patent is to form a thin film such that "a minimum amount of conductive agent can be use." See column 2, lines 42-50. There is no teaching that forming an even thinner film would serve any purpose. Thus, the Dansui patent teaches that it is preferred not to have an electrode thinner than 10 microns. The Examiner asserts on page 11 of the final Office Action that an obvious motivation is to alter the thickness to increase or decrease the battery capacity. However, battery capacity also depends on the area of the electrode and the configuration of the battery. There is no teaching in the art to make a battery electrode thinner to decrease battery capacity. It is not a reasonable objective to decrease battery capacity. With all due respect, the Examiner is using hindsight based on Applicants' disclosure and rationalizing a motivation out of thin air. The art does not provide the legally required motivation.

There are many ways to select the capacity of a battery. Of course, it is generally desirable to increase the capacity of a battery as long as other desired criteria are met. Some of the nanoparticle materials discovered by employees of the present assignee's preicessor in interest have increased energy densities that improved the capacity. Also, the capacity can be varied by changing the surface area of the electrode, by winding the electrode, stacking multiple electrodes in parallel, etc. Similarly, the selection of a current collector thickness generally can involve a balancing of factors. The Examiner has not provided any suggestion in the cited references to motivate the modifications claimed by Applicants. Similarly, the Examiner has not pointed to any teachings in the art that the thickness of the electrodes on a micron scale would be considered as a reasonable approach for varying the battery capacity.

Furthermore, Applicants teach suitable approaches for the processing of thin battery electrodes. These improved processing approaches are combined with improved approaches for the forming electroactive particles with more uniformity and smaller particles sizes with

correspondingly improved performance. These approaches provide for the formation of thinner smoother electrodes. Without being able to form appropriately smooth electrodes, the formation of thinner electrodes would not be expected to yield suitable performance. Applicants improved processes and materials provide a significant leap in battery technology.

On the other hand, the Dansui patent teaches the formation of battery electrodes using conventional approaches. For example, in Example 1, a paste is formed that is applied to the current collector foil, and the resulting structure is rolled. The electrode thickness in the examples of the Dansui patent range from 65 microns to 120 microns.

Since the Dansui patent teaches away from the suggested modification, since Applicants have provided a teaching for the effective formation of the claimed invention that is lacking in the Dansui patent and since the Examiner's analysis is based on hindsight in view of Applicants' own disclosure, the Examiner has failed to establish prima facie obviousness.

Group 7 Claims

With respect to claims 86 and 87, these claims further specify that the current collector has a thickness of less than about 4.5 microns by way of their dependence from claim 84. With respect to the current collector, the Dansui patent specifies a **preferred** thickness from 5-20 microns at column 3, lines 3-4. The Dansui patent provides no motivation or rationale to select a thickness outside of this range. The Examiner states that the motivation to use a thinner current collector is the decrease in size. However, the Examiner's hindsight analysis ignores a great number of other possible factors. For example, thinner electrodes may not be practical for use in conventional electrode formation due to tearing or difficulty of handling. The art does not provide the teaching to support the Examiner's asserted motivation. The Examiner's hindsight analysis using Applicant's own teaching does not generate a prima facie case of obviousness.

Group 8 Claims

These claims further specify a current collector with an average thickness less than about 2.5 microns (claim 88) or from about 0.25 microns to about 1 micron. These values of current collector thickness are far from the "preferred" values in the Dansui patent and are clearly free of the cited art.

Applicants respectfully request withdrawal of the rejection of claims 78-83 and 86-89 under 35 U.S.C. § 103(a) as being obvious over the Dansui patent.

E. REJECTIONS OVER DANSUI ET AL. AND SATOH ET AL.

The Examiner rejected claims 34, 35, 37, 38, 41, 52, 54, 64, 65, 67, 68, 71-75 and 77 under 35 U.S.C. § 103(a) as being obvious over the Dansui patent in view of U.S. Patent 5,571,638 to Satoh et al. (the Satoh patent, Appendix C). The Examiner cited the Satoh patent for teaching features relating to battery construction. The shortcomings of the Dansui patent with respect to Applicants' claimed invention are described above in detail. The Satoh patent does not make up for the shortcomings of the Dansui patent with respect to Applicants' claimed invention. Thus, the combined teachings of the Dansui patent and the Satoh patent do not render Applicants' claimed invention prima facie obvious. Applicants respectfully request reconsideration of the rejection based on the following comments.

The Dansui patent does not teach, suggest or motivate an electrode with a thickness of less than about 9.5 microns. The Satoh patent similarly does not teach, suggest or motivate an electrode with a thickness of less than about 9.5 microns. In particular, the examples of the Satoh patent describe electrodes with thickness of 150 microns (Example 8). Since neither of the cited references teaches, suggests or motivates Applicants' claimed invention, the combined teachings of the references do not render Applicants' claimed invention prima facie obvious.

Claims of Group 2

The claims of Group 2 further specify that the electroactive particles have an average particle diameter of less than about 100 nm. The Examiner points to the Satoh patent for teaching electroactive particles in the particular size range. However, the Satoh patent teaches graphitic carbon as a lithium intercalation material. On the other hand, the Dansui patent teaches nickel-hydrogen batteries, and not lithium-based batteries. There is no teaching that the graphitic carbon of the Satoh patent would be electroactive in the nickel-hydrogen batteries of the Dansui patent. Thus, there is both no motivation to combine the teachings as suggested by the Examiner, and the resulting battery from the combined disclosures is inoperative. Thus, the combined disclosures certainly do not render group 2 claims prima facie obvious.

Claims of Group 4

These claims are directed to electrodes with a specified surface roughness. The Examiner acknowledges that neither of the cited references teach an electrode with the claimed surface roughness. However, the Examiner points to a description of the surface roughness of the current collector to support this rejection. With all due respect, the Examiner's assertions are not on point. First, the current collector is a metal structure, while the electrode surface is formed from a composite of a polymer binder with a high loading of particles. These are completely different materials such that the description of the surface roughness of one material does not relate to the surface roughness of the other. In addition, the Satoh patent teaches that increased surface roughness is desirable for the current collector. See column 8, lines 6-12 where the current collector is subjected to a roughening treatment. Since the cited references do not teach any relevant information relating to the surface roughness of the electrode, the Examiner has fallen far short of establishing prima facie obviousness for the group 4 claims.

Group 5 Claims

These claims are directed to electrodes with electroactive particles having a specified degree of particle uniformity. The Examiner does not seem to comment at all on the uniformity

feature of these claims. Therefore, the Examiner has clearly not established prima facie obviousness of these claims.

Summary of Rejections Over the Dansui Patent and the Satoh Patent

Since the combined teachings of the Dansui patent and the Satoh patent do not render Applicants' claimed invention prima facie obvious, Applicants respectfully request withdrawal of the rejection of claims 34, 35, 37, 38, 41, 52, 54, 64, 65, 67, 68, 71-75 and 77 under 35 U.S.C. § 103(a) as being obvious over the Dansui patent in view of the Satoh patent.

F. REJECTION OVER DANSUI ET AL. AND KAWAKAMI ET AL.

The Examiner rejected claims 34-43, 53, 64-68, 70-73, 76 and 77 under 35 U.S.C. § 103(a) as being unpatentable over the Dansui patent in view of U.S. Patent 6,165,642 to Kawakami et al. (the Kawakami patent, Appendix D). The Examiner cited the Kawakami patent for disclosing various features of a rechargeable lithium battery. The shortcomings of the Dansui patent with respect to Applicants' claimed invention were described in detail above. The Kawakami patent does not make up for the deficiencies of the Dansui patent. Thus, the combined disclosures of the Dansui patent and the Kawakami patent do not render Applicants' claimed invention prima facie obvious. Applicants respectfully request reconsideration of the rejections based on the following comments.

The Dansui patent does not teach, suggest or motivate an electrode with a thickness of less than about 9.5 microns. The Kawakami patent similarly does not teach, suggest or motivate an electrode with a thickness of less than about 9.5 microns. Since neither of the cited references teaches, suggests or motivates Applicants' claimed invention, the combined teachings of the references do not render Applicants' claimed invention prima facie obvious. Applicants note a few other issues with respect to this reference. The Examiner incorrectly states that the Kawakami patent teaches particles with a size distribution of 0.5 to 50 nm. This size range refers

to **pore sizes not particle sizes**. In fact, the particles formed from a solid state reaction are likely fused to form these pores. Therefore, the nature of the "primary particles" in the Kawakami patent are far from clear and are likely sintered agglomerates.

Furthermore, there is no motivation to combine the Dansui patent and the Kawakami patent since they are based on different chemistries. The Dansui patent is directed to nickel-hydrogen batteries, while the Kawakami patent is directed to lithium-based batteries. The particular components of these structures are not interchangeable while yielding an operable battery.

Group 2 - Claim 40

This claim is directed to a battery with the separator comprising a nonliquid electrolyte. Applicants could not identify in the Kawakami patent the description of a solid electrolyte. Also, it is not clear how the gel electrolytes relate to the battery separator. Specifically, the Kawakami patent states at column 10, lines 38-42 that "an electrolyte solution obtained by dissolving an appropriate electrolyte in a solvent is desired to be used in a way that said electrolyte solution is retained in the porous separator 304 disposed between the anode 301 and the cathode 302." Furthermore, there is no motivation to combine the teachings of the Dansui patent and the Kawakami patent due to the different chemistries, as described above. Therefore, the Examiner has not established prima facie obviousness of claim 40.

Group 4- Claim 77

This claim is directed to a battery having particles with a specified particle size uniformity. With respect to this claim, there seems to be some confusion regarding the teachings of the Kawakami patent. The Kawakami patent teaches a distribution of **pore sizes** and not a distribution of particle sizes. Therefore, the Kawakami patent is silent on the distribution of particle sizes. The other significant shortcomings of the combined teachings of these two patents

is discussed in detail above. The Examiner has fallen far short of establishing the prima facie obviousness of claim 77.

Summary of the Rejections Based on the Dansui Patent and the Kawakami Patent

Since the combined teachings of the Dansui patent and the Kawakami patent do not render Applicants' claimed invention prima facie obvious, Applicants respectfully request withdrawal of the rejection of claims 34-43, 53, 64-68, 70-73, 76 and 77 under 35 U.S.C. § 103(a) as being unpatentable over the Dansui patent in view of the Kawakami patent.

G. REJECTIONS OVER DANSUI ET AL., KAWAKAMI ET AL. AND MIYASAKA ET AL.

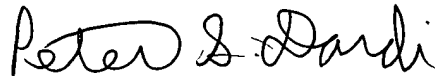
The Examiner rejected claims 36 and 66 under 35 U.S.C. § 103(a) as being unpatentable over the Dansui patent in view of the Kawakami patent, as applied above, and further in view of U.S. Patent 6,037,095 to Miyasaka et al. (the Miyasaka patent, Appendix E). The Examiner cites the Miyasaka patent for teaching tin oxide for use in an anode or negative electrode. The deficiencies of the Dansui patent and the Kawakami patent were discussed in detail above. However, the Miyakami patent does not make up for the deficiencies of the Dansui patent and the Kawakami patent with respect to Applicants' claimed invention. In particular, the Miyakami patent does not teach, suggest or motivate an electrode with a thickness of less than about 9.5 microns. Furthermore, there is no motivation to combine the disclosure of the Miyakami patent relating to lithium-based batteries with the Dansui patent directed to nickel-hydrogen batteries. Thus, the combined teachings of the Dansui patent, the Kawakami patent and the Miyasaka patent do not teach, suggest or motivate all of the features of Applicants' claimed invention. The combined teachings of the cited references do not render Applicants' claimed invention prima facie obvious. Applicants respectfully request withdrawal of the rejection of claims 36 and 66

under 35 U.S.C. § 103(a) as being unpatentable over the Dansui patent in view of the Kawakami patent, as applied above, and further in view of the Miyasaka patent.

CONCLUSIONS AND REQUEST FOR RELIEF

Applicants submit that claims 29-44, 52-54 and 58-89 are free of the cited references, are clear and are fully supported by the specification as filed. Thus, Applicants respectfully request the reversal of the rejections of claims, and the allowance of claims 29-44, 52-54 and 58-89.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Peter S. Dardi". The signature is fluid and cursive, with the first name "Peter" and last name "Dardi" clearly distinguishable.

Peter S. Dardi, Ph.D.
Registration No. 39,650

Customer No. 24113
Patterson, Thunte, Skaar & Christensen, P.A.
4800 IDS Center
80 South 8th Street
Minneapolis, Minnesota 55402-2100
Telephone: (612) 349-5746

APPENDIX A - Pending Claims

29. A battery comprising:
a positive electrode;
a negative electrode; and a
separator between the positive and negative electrode, wherein at least one of the electrodes has an average thickness less than about 9.5 microns and comprises a powder, the powder comprising electroactive particles having an average primary particle diameter less than about 500 nm.
30. The battery of claim 29 wherein the positive electrode has an average thickness less than 10.0 microns and comprises electroactive particles having an average primary particle diameter less than about 500 nm.
31. The battery of claim 29 wherein the negative electrode has an average thickness less than 10 microns and comprises electroactive particles having an average primary particle diameter less than about 500 nm.
32. The battery of claim 29 wherein both the negative electrode and the positive electrode have an average thickness less than 10 microns and comprises electroactive particles having an average primary particle diameter less than about 500 nm.
33. The battery of claim 29 wherein the separator has a thickness less than about 10 microns.

34. The battery of claim 29 wherein the negative electrode comprises a lithium intercalation compound.
35. The battery of claim 29 wherein the negative electrode comprises lithium metal or a lithium alloy.
36. The battery of claim 29 wherein the negative electrode comprises tin oxide or derivatives thereof.
37. The battery of claim 29 wherein at least one of the electrodes comprises electroactive particles having an average diameter less than about 100 nm.
38. The battery of claim 29 wherein the positive electrode comprises a composition selected from the group consisting of vanadium oxide, silver vanadium oxide, manganese oxide, lithium manganese oxide, lithium titanium oxide, lithium cobalt oxide, lithium nickel oxide, iron sulfides, molybdenum sulfide and mixtures, composites and derivatives thereof.
39. The battery of claim 29 wherein the separator comprises a polymer.
40. The battery of claim 29 wherein the separator comprises a nonliquid electrolyte comprising a lithium compound between the positive electrode and the negative electrode.
41. The battery of claim 29 further comprising a current collector in electrical contact with the positive electrode, the current collector comprising aluminum metal, copper metal or stainless steel metal.

42. The battery of claim 41 wherein the current collector is a foil or an expanded mesh.
43. The battery of claim 29 further comprising a current collector in electrical contact with the negative electrode, the current collector comprising aluminum metal, copper metal or stainless steel metal.
44. The battery of claim 29 further comprising a current collector comprising graphite paper, the current collector being in electrical contact with the positive electrode or the negative electrode.
52. The battery of claim 29 wherein the surface of at least one of the electrodes at the separator has a root mean square surface roughness less than about 5 microns.
53. The battery of claim 29 wherein the electrodes comprise supplementary electrically conductive particles.
54. The battery of claim 29 wherein at least one electrode has effectively no electroactive particles with a diameter greater than about four times the average diameter of the collection of electroactive particles.
58. The battery of claim 29 wherein the at least one electrode further comprises a binder.
59. A battery comprising:
a positive electrode;

a negative electrode;

a separator between the positive and the negative electrode, wherein at least one of the electrodes has an average thickness less than about 9.5 microns and comprises a binder and electroactive particles having an average primary particle diameter less than about 500 nm.

60. The battery of claim 59 wherein the positive electrode has an average thickness less than 10 microns and comprises electroactive particles having an average primary particle diameter less than about 500 nm.

61. The battery of claim 59 wherein the negative electrode has an average thickness less than 10 microns and comprises electroactive particles having an average primary particle diameter less than about 500 nm.

62. The battery of claim 59 wherein both the negative electrode and the positive electrode have an average thickness less than 10 microns and comprises electroactive particles having an average primary particle diameter less than about 500 nm.

63. The battery of claim 59 wherein the separator has a thickness less than about 10 microns.

64. The battery of claim 59 wherein the negative electrode comprises a lithium intercalation compound.

65. The battery of claim 59 wherein the negative electrode comprises lithium metal or a lithium alloy.

66. The battery of claim 59 wherein the negative electrode comprises tin oxide or derivatives thereof.

67. The battery of claim 59 wherein at least one of the electrodes comprises electroactive particles having an average diameter less than about 100 nm.

68. The battery of claim 59 wherein the positive electrode comprises a composition selected from the group consisting of vanadium oxide, silver vanadium oxide, manganese oxide, lithium manganese oxide, lithium titanium oxide, lithium cobalt oxide, lithium nickel oxide, iron sulfides, molybdenum sulfide and mixtures, composites and derivatives thereof.

69. The battery of claim 59 wherein the separator comprises a polymer.

70. The battery of claim 59 wherein the separator comprises a nonliquid electrolyte comprising a lithium compound between the positive electrode and the negative electrode.

71. The battery of claim 59 further comprising a current collector in electrical contact with the positive electrode, the current collector comprising aluminum metal, copper metal or stainless steel metal.

72. The battery of claim 71 wherein the current collector is a foil or an expanded mesh.

73. The battery of claim 59 further comprising a current collector in electrical contact with the negative electrode, the current collector comprising aluminum metal, copper metal or stainless steel metal.

74. The battery of claim 59 further comprising a current collector comprising graphite paper, the current collector being in electrical contact with the positive electrode or the negative electrode.

75. The battery of claim 59 wherein the surface of at least one of the electrodes at the separator has a root mean square surface roughness less than about 5 microns.

76. The battery of claim 59 wherein the electrodes comprise supplementary electrically conductive particles.

77. The battery of claim 59 wherein at least one electrode has effectively no electroactive particles with a diameter greater than about four times the average diameter of the collection of electroactive particles.

78. The battery of claim 29 wherein at least one of the electrodes has an average thickness less than about 5 microns.

79. The battery of claim 29 wherein at least one of the electrodes has an average thickness from about 250 nm to about 2.5 microns.

80. The battery of claim 29 wherein at least one of the electrodes has an average thickness from about 300 nm to about 1 micron.

81. The battery of claim 59 wherein at least one of the electrodes has an average thickness less than about 5 microns.

82. The battery of claim 59 wherein at least one of the electrodes has an average thickness from about 250 nm to about 2.5 microns.

83. The battery of claim 59 wherein at least one of the electrodes has an average thickness from about 300 nm to about 1 micron.

84. A battery comprising:
a positive electrode;
a negative electrode;
at least one current collector; and a
separator between the positive and negative electrode, wherein at least one of the electrodes has an average thickness less than about 10 microns and wherein the at least one current collector has an average thickness less than about 4.5 microns.

85. The battery of claim 84 wherein at least one of the electrodes has an average thickness less than about 9.5 microns.

86. The battery of claim 84 wherein the positive electrode has an average thickness less than 5 microns and comprises electroactive particles having an average primary particle diameter less than about 500 nm.

87. The battery of claim 84 wherein the negative electrode has an average thickness less than 5 microns and comprises electroactive particles having an average primary particle diameter less than about 500 nm.

88. The battery of claim 84 wherein the at least one current collector has an average thickness less than about 2.5 microns.

89. The battery of claim 84 wherein the at least one current collector has an average thickness from about 0.25 microns to about 1 micron.